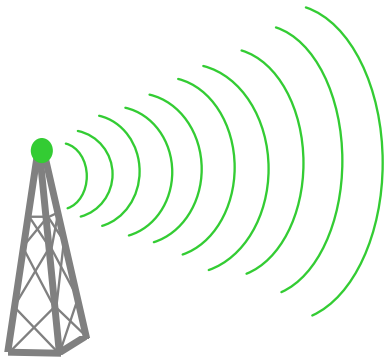
CSX TRANSPORTATION



C B T M

Communications Based Train Management

March 3, 2005

RSAC PTC Working Group

- Established safety objectives for PTC systems
  - Prevent Train-to-Train Collisions
  - Enforce Speed Restrictions
  - Provide Protection for Roadway Workers
- Does not imply vitality or moving block
- CBTM meets these objectives

PTC versus PTS

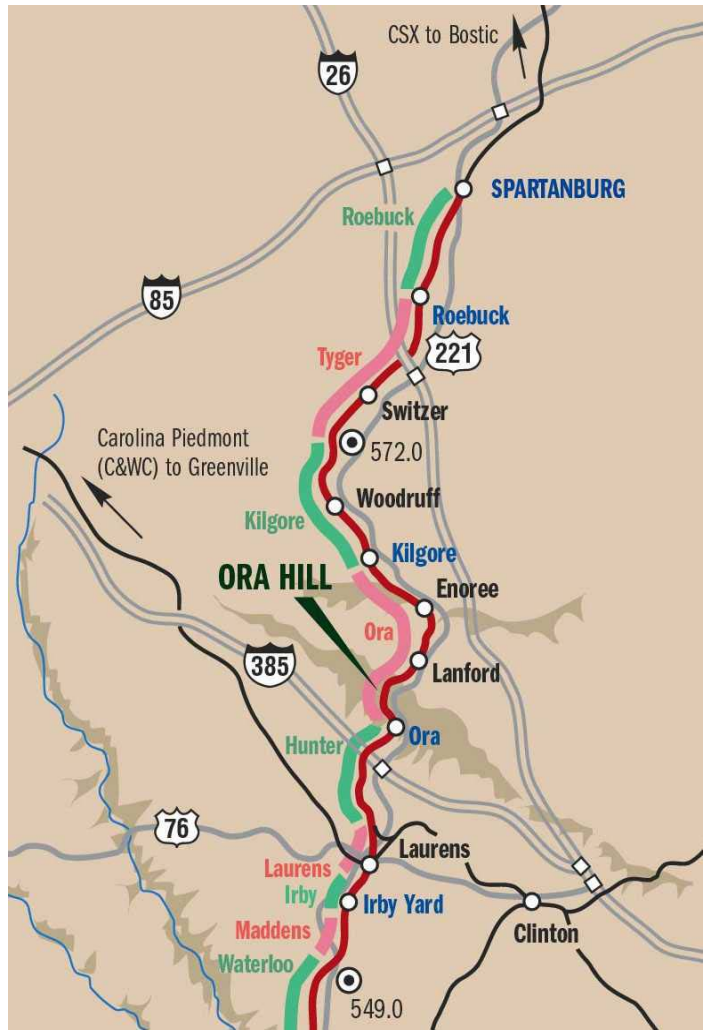
- PTS (Positive Train Separation)
  - Describes any processor-based train control system that meets only the first core objective:
    - Prevent Train-to-Train collisions
- CBTM is more than just PTS

RSAC PTC Working Group cont'd

- Developed the Notice of Proposed Rulemaking (NPRM)
  - Applies to processor-based signal and train control systems, which contain new or novel technology
    - Includes overlay systems such as CBTM
  - Rule requires the railroad meet a performance standard, i.e. the new implementation must be as good or better than the existing system
    - Requires a risk assessment to compare the base case (existing system) to the proposed system
    - **CSXT believes CBTM meets this requirement**

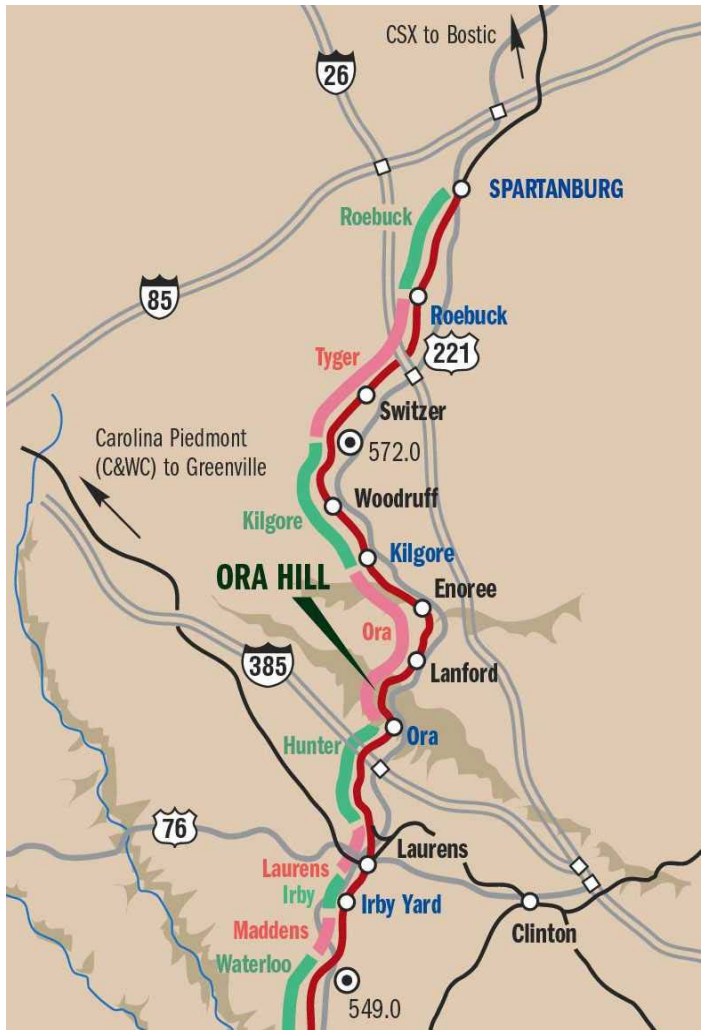
C B T M

- Development and testing of CBTM began before the completion of the NPRM
  - Applied for and received a test waiver from the FRA



C B T M

- CBTM is an overlay, safety enhancement system currently for non-signaled territory
- Existing method of operation remains in place
- Crew maintains primary responsibility
  - CBTM does not display authorities or messages unless train is enforced

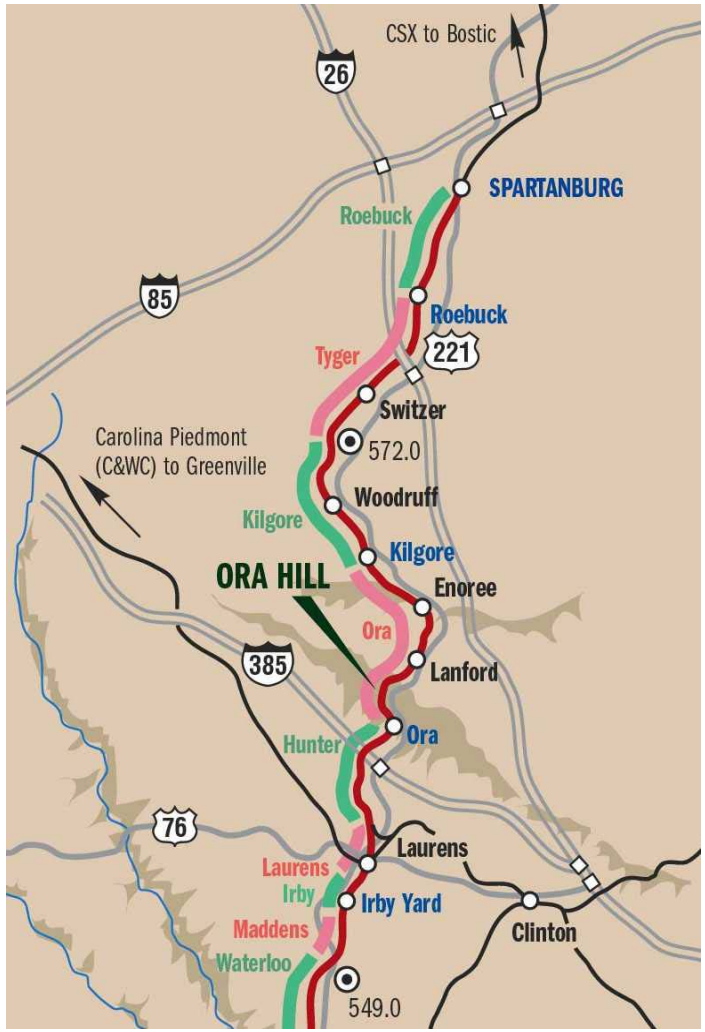


CBTM Is Not Vital

- CBTM is not trying to replace existing systems
  - CBTM relies on these proven forms of train control
- CBTM is considered to be a safety-critical system
  - It must perform correctly to provide protection for equipment and personnel
- CBTM performs no vital functions
  - Vital functions are required to be implemented in a fail safe manner, i.e. a failure will not result in the system entering or maintaining an unsafe state or it will assume a known safe state
  - A failure of CBTM has the effect of suspending the safety benefits associated with its use
    - There is no need to fallback to another method of operation

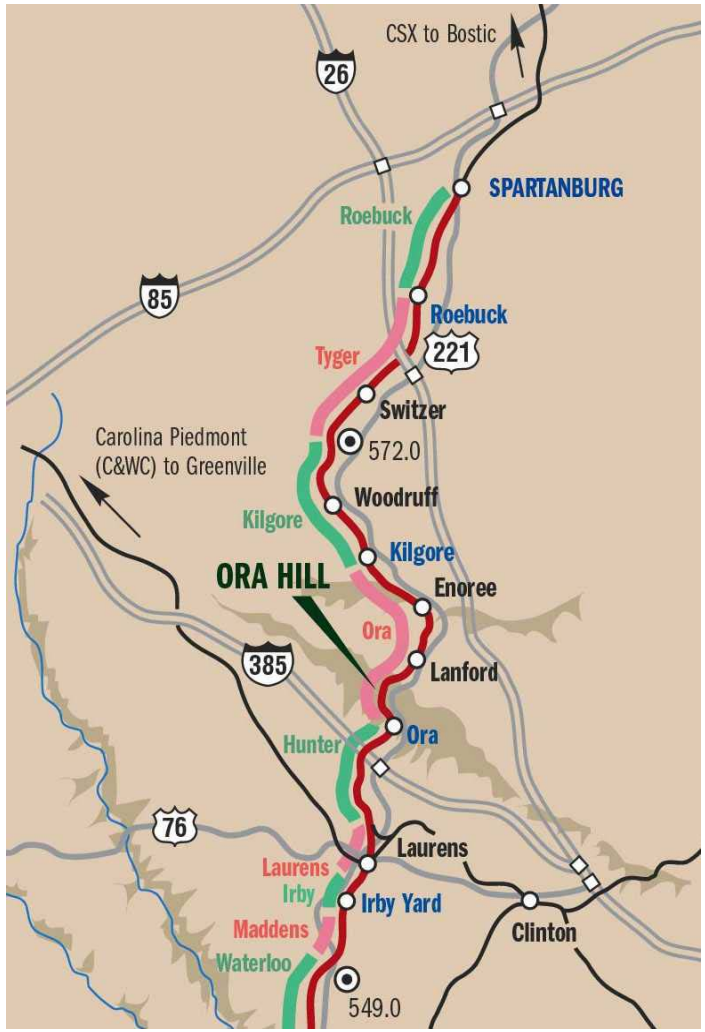
C B T M

- Why?
  - Simple
  - Achieves the required safety benefits
  - Future potential
    - Basic principles are applicable to signal territory
      - Development and lab testing complete



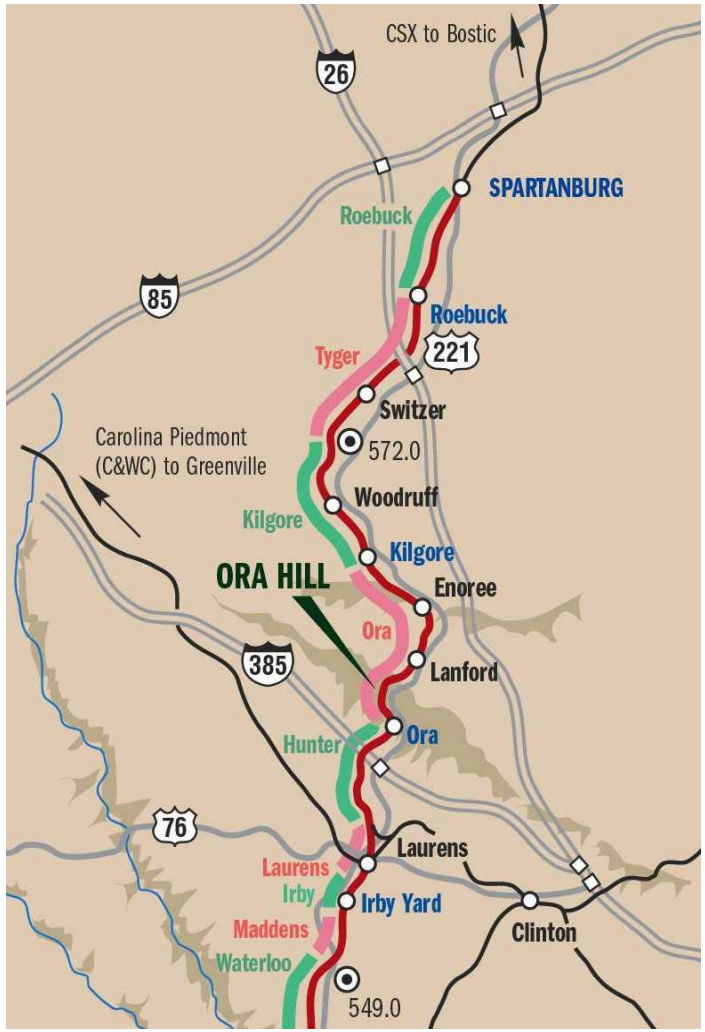
C B T M

- Enhances safety by:
  - Enforcing train stop at end of authority
  - Predictively and reactively enforcing both temporary and permanent speed restrictions
  - Monitoring manual switch position

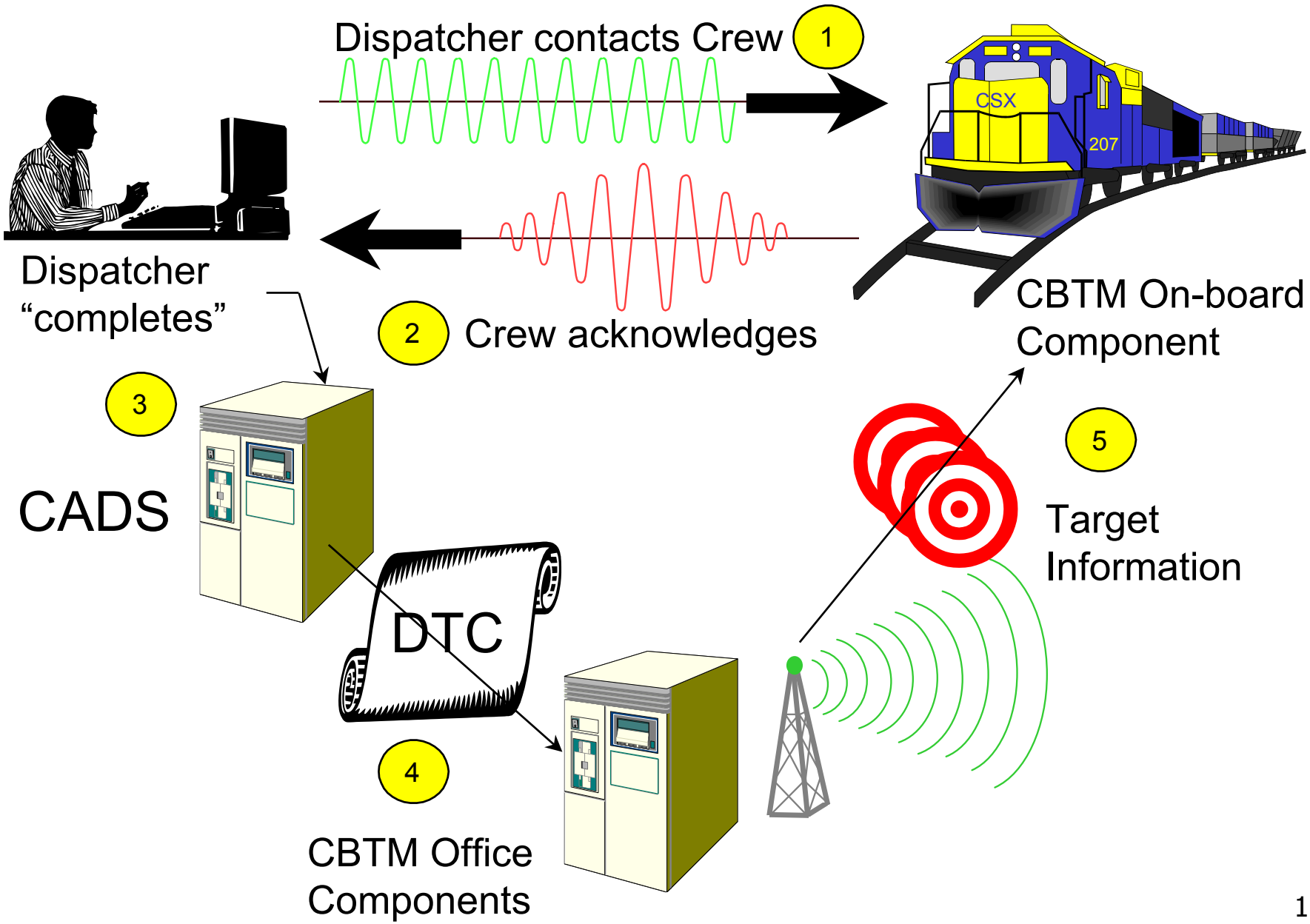


C B T M

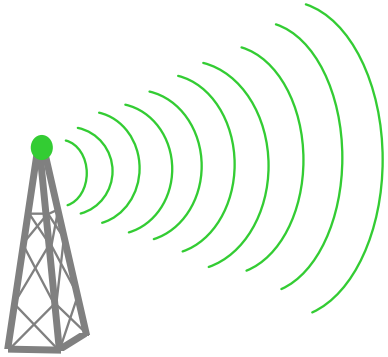
- Enhances safety by:
  - Protecting the entrance to engineering department work authorities, thereby protecting Roadway Workers
  - Reacting to dynamic changes to authorities

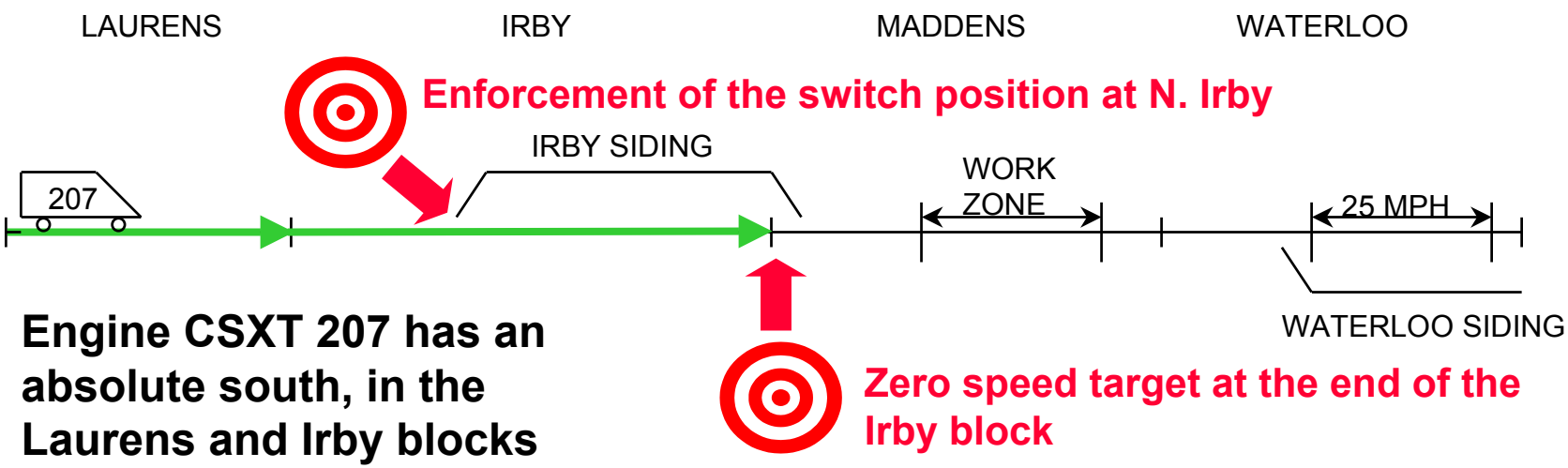


CBTM - How it works



GENERATION OF TARGETS

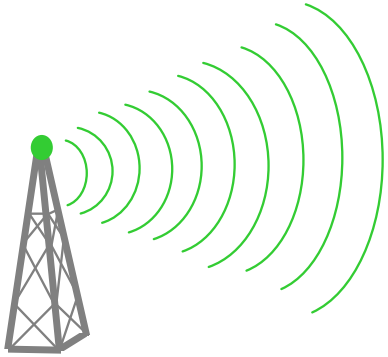


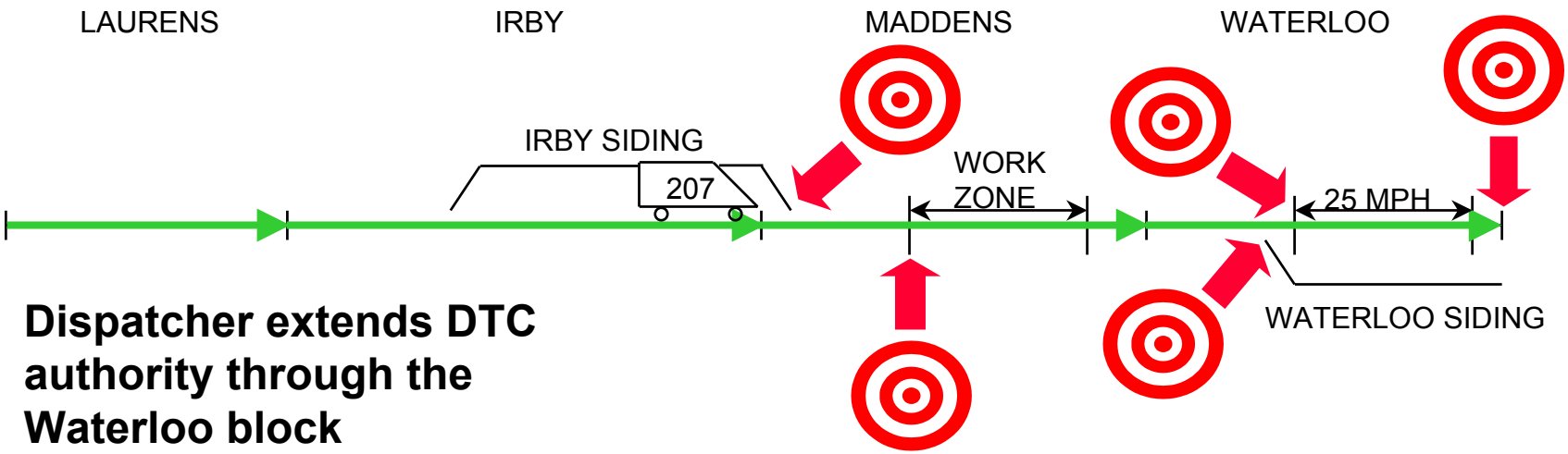


Engine CSXT 207 has an absolute south, in the Laurens and Irby blocks

CBTM is continuously monitoring train speed relative to the maximum permissible speed, for reactive enforcement purposes

GENERATION OF TARGETS





Dispatcher extends DTC authority through the Waterloo block

TARGETS:

- **Enforcement of the switch position at S. Irby**
- **Entrance to the Conditional Stop (Work Zone), which is time dependent**
- **Enforcement of switch position at N. Waterloo**
- **Speed reduction to 25 MPH**
- **Zero speed target at the end of the Waterloo block**

CBTM Program
Goals and Objectives

- Conduct an approved test program for new technology
  - Eliminate issues preventing implementation
- Gather data on system performance and evaluate effectiveness
  - Identify and implement enhancements
  - Resolve system issues
- Evaluate technological advances
  - Drive down implementation costs
    - E.g. CBTM territory is the test bed for the FRA sponsored development and testing of a Communications Management Unit (CMU)
      - Goal is to support interoperability between PTC systems